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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/529,449	03/28/2005	Kazuyuki Yamane	10936-84	8257
24256 7590 02/02/2007 DINSMORE & SHOHL, LLP 1900 CHEMED CENTER 255 EAST FIFTH STREET CINCINNATI, OH 45202			EXAMINER TOSCANO, ALICIA	
			ART UNIT 1712	PAPER NUMBER
SHORTENED STATUTORY PERIOD OF RESPONSE			MAIL DATE	DELIVERY MODE
3 MONTHS			02/02/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/529,449

Applicant(s)

YAMANE ET AL.

Examiner

Alicia M. Toscano

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 March 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>6/20/05</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 1-4, 6-14, 16, 17 and 19-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Matsumoto (JP 2001323056).

Matsumoto discloses aliphatic polyesters. Said polyesters are the reaction product of polylactic acid and an oxazoline (abstract). The polylactic acid may be produced from the ring opening polymerization of a cyclic dimer [0010]. The oxazoline compound may be 2,2'-diphenylene bis(2-oxazoline) [0014], [0021] and examples. The oxazoline is reacted at a temperature of around 220C [0036]. The molecular weight of the polylactic acid, before reaction with oxazoline, is from 50,000 to 300,000 [0010]. Matsumoto discloses the use of the oxazoline to terminate the carboxyl end groups of the polylactic acid, however, it is the Examiners position that use of the bis(2-oxazoline) inherently crosslinks, or chain extends, via reaction between two neighboring polylactic acid end groups. The "rate of increase" (which Examiner notes is not a "rate" rather a ratio of MW_{initial} to MW_{final}) required by Claims 1-4, 8, 11-13 and 20 requires only a 10-35% increase in molecular weight. Since the oxazoline will inherently bond two ends of neighboring polylactic acid chains the Examiner finds the small increase in molecular weight to be inherent in the reaction of Matsumoto. Thus, the limitations of Claims 1, 2,

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3, 4, 9, 10, 11, 12, 13, 14 and 16 are met as discussed above. The polydispersity of polymer compositions is high unless specific conditions are met to yield a low PDI.

Since the reaction conditions of the polylactic acid have been met the Examiner finds the PDI of at least 1.9 to be inherent in the composition of Matsumoto, as required by Claims 8 and 20. The wt% of oxazoline is disclosed in Table 1 to be from 0.4 to 2, as required by Claim 17. As the composition requirements have been met Examiner finds the properties of Claims 6, 7 and 19 to be inherent.

2. Claims 1-4, 6-9, 11-13, 16 and 19-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Bonsignore (US 5470944).

Bonsignore discloses the production of high molecular weight polylactic acid or polyglycolic acid. Said polylactic acid is produced by reacting the carboxyl end groups of the polylactic acid with bis-oxazoline (abstract). The polylactic acid or polyglycolic acid may be produced by the ring opening polymerization of dilactones (Column 3 Lines 62-65). The molecular weight of the polylactic acid before the reaction is 2,000-15,000 (Column 1 Line 17). The molecular weight after reaction with a bis-oxazoline is 50,000-100,000 (Column 6 Lines 26-28). This ratio of before and after MW's meets the requirements of Applicants ranges of Claims 1-4, 8, 9, 11-13, 16 and 20. The polydispersity of polymer compositions is high unless specific conditions are met to yield a low PDI. Since the reaction conditions of the polylactic acid has been met the Examiner finds the PDI of at least 1.9 to be inherent in the composition of Bonsignore,

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as required by Claims 8 and 20. As the composition requirements have been met the Examiner finds the properties of Claims 6, 7 and 19 to be inherent.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
3. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Matsumoto or Bonsignore.

Matsumoto and Bonsignore include elements of the invention as discussed above. Matsumoto nor Bonsignore disclose a reaction time of between 5 and 40 minutes, as required by Claim 15. The time of reaction will dictate the crosslink density and thus the molecular weight of the polylactic-co-oxazoline product. The molecular weight of the polylactic acid dictates the overall properties of the resin. Higher molecular weight will yield better strength and mechanical properties than low molecular

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weight polymer however too high of a molecular weight will lead to difficulties with molding.

It would have been obvious to one of ordinary skill in the art at the time of the invention to tailor the reaction time of Masumoto or Bonsignore in order to achieve the desired crosslink density, or molecular weight, of the polylactic acid in order to create articles with superior molding properties.

4. Claims 5, 10 and 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bonsignore in view of Matsumoto.

Bonsignore includes elements of the invention as discussed above. Bonsignore discloses a start MW of 2000-15,000 and an end MW of 50K-100K. Bonsignore does not disclose the use of an end MW of greater than 150K, as required by Claims 5 and 18.

Matsumoto includes elements of the invention as discussed above. Matsumoto discloses the use of a polylactic acid of MW between 100k and 300k because when the MW is within this range the physical properties, such as strength, are excelled [0010].

It would have been obvious to one of ordinary skill in the art at the time of the invention to include in Bonsignore the use of an end MW of between 100k and 300k, as taught by Matsumoto, in order to create molded articles with superior strength.

Bonsignore does not include the use of a specific bis-oxazoline nor the amount of bis-oxazoline useful to create high molecular weight polylactic acid. Matsumoto discloses the use of 0.5-2 wt% 2,2'-m-phenylene bis(2-oxazoline) [0021], Examples,

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Table 1. 2,2'-m-phenylene bis(2-oxazoline) is preferred because of its stability with the polyester resin [0021], and the amount used is preferred so as to minimize the amount of unreacted bis-oxazoline in the composition [0021]. It would have been obvious to one of ordinary skill in the art at the time of the invention to include in Bonsignore the use of 0.5-2 wt% of 2,2'-m-phenylene bis(2-oxazoline), as taught by Matsumoto, since this amount of said species is taught to have superior stability in the resin and this would thusly lead to a superior end product.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. LI (US 6153231) discloses the reaction mechanism of bis-oxazoline reacting/crosslinking with the carboxyl end groups of polymers.

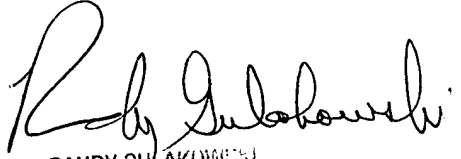
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alicia M. Toscano whose telephone number is 571-272-2451. The examiner can normally be reached on Monday to Friday 8:30 AM to 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski can be reached on 571-272-1302. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AMT



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